REMARKS

This is a response to the Office Action dated May 01, 2008.

SUMMARY OF OFFICE ACTION

In the Office Action, Claims 7-9 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent Application No. 6,172,483 issued to Champlin. Claims 1-3 were rejected under 35 U.S.C. §103(a) as being unpatentable over Champlin in view of U.S. Patent Application No. 6,076,018 issued to Sturman et al. Claims 1-11 were rejected under 35 U.S.C. §112, 1st paragraph. Claims 1-3 and 7-9 were rejected under 35 U.S.C. §112, 2nd paragraph. Claims 4-6 and 10-11 were objected to as being in improper form.

Additionally, the specification was objected to for failing to include a brief description of the drawings.

APPLICANT'S RESPONSE

I. OBJECTIONS

In the Office Action, the specification was objected to for failure to include a brief description of the drawings. Also, the claims were objected to for failing to insert a colon after the traditional phrase comprising. Finally, Claims 4-6 and 10-11 were objected to under 37 CFR 1.75(c) as being in improper form.

In response to the objections, Applicant has amended the specification to include a brief description of the drawings. No new matter is added in the brief description of the drawings added to the specification. Applicant has also amended the claims to include a colon after the transitional phrase comprising. Furthermore, Applicant has amended Claims 4-6 and 10-11 to no longer depend on more than one claim.

For the foregoing reasons, Applicant submits that the amendments have overcome the objections cited in the Office Action.

II. CLAIM REJECTIONS BASED UPON 35 USC §112, FIRST PARAGRAPH

In the Office Action, Claims 1-11 were rejected under 35 USC §112, first paragraph. In particular, the Office Action requested the meaning of the portion of Claim 1 which recites, "for the generation of a short circuit in a fuel cell."

In response, Applicant has amended Claim 1 to recite, "a MOSFET module having at least one MOSFET device for receiving a signal from the driver at a gate module of the MOSFET device." In other words, the MOSFET device has a gate module which is configured to receive a signal from the driver. The MOSFET device generates a short circuit by applying a signal to the MOSFET's gate module by means of the driver circuit. This enables the MOSFET device to function similar to a fast switch capable of supporting high currents. The MOSFET module includes at least one MOSFET device in order to obtain a short circuit pulse for a brief switching period, for example, 0.1 to 100 milliseconds (msec). As illustrated in the schematic of Figure 1, the schematic discloses an input unit which generates a configurable time range pulse. There is a driver that fits the input pulse for piloting the MOSFET. The input pulse that pilots the MOSFET causes the short circuit in the fuel cell.

Short circuiting the fuel cell or fuel cell stacks enables accurate measurement of internal ohmic losses of the fuel cell(s). Enabling the short circuit of the fuel cell(s) for a brief switching period allows for current and voltage measurements while preventing electrochemical factors because of the short time period in which the fuel cell(s) is short circuited. The power produced by a fuel cell is exploited in order to cause the short circuit. The endurance of the short circuit must be long enough to survive the end of a reactance effect on the response, and at the same time fast enough to avoid fuel cell damage and electrochemical phenomena, such as polarization or diffusion.

For the foregoing reasons, reconsideration and withdrawal of the rejection of the claims based upon 35 U.S.C. §112, first paragraph is respectfully requested.

III. CLAIM REJECTIONS BASED UPON 35 USC §112, SECOND PARAGRAPH

Claims 1-3 and 7-9 were rejected under 35 USC §112, second paragraph, based on the view that the claims are indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In response, Applicant has amended Claim 1 to recite, "a measuring circuit having a shunt for generating a resistance upon receiving a current signal." In other words, the shunt does not convert the voltage into a current signal. Rather, the voltage and resistance values associated with the shunt when there is a current is flowing through may be used to calculate the current value. The current flowing through the shunt generates a resistance at the shunt ends. By measuring the voltage and the resistance, the current value can then be calculated. The shunt is used for obtaining the value of the current by means of voltage measurement at its ends.

Additionally, the Examiner requested clarification as to what is meant by "differential amplifiers for the current and the voltage signal?" Office Action at 5. In response, the measurement circuit may include two differential amplifiers. A first differential amplifier may be associated with the voltage signal and a second differential amplifier may be associated with the current signal. The differential amplifiers may differentiate and isolate the current and voltage signals to be measured. Subsequently, the signals may be sent to the data acquisition system. The ability to short circuit the fuel cell or stack of fuel cells enables the measurement of the difference in the current signal (ΔI) and the voltage signal (ΔV).

For the foregoing reasons, reconsideration and withdrawal of the rejection of the Claims 1-3 and 7-9 based upon 35 U.S.C. §112, second paragraph is respectfully requested.

IV. CLAIM REJECTIONS BASED UPON 35 U.S.C. §102(b)

In the Office Action, Claims 7-9 were rejected under 35 U.S.C. 102(b) as being anticipated by Champlin. The Champlin reference does not anticipate Applicant's claimed inventions for the reasons detailed below.

The Champlin reference deduces the impedance value by means of a series of short circuits. The impedance value is then calculated by summing the various resistances associated with the circuit disclosed in the Champlin reference. The various resistances include an ohmic

resistance, a capacitive reactance, and an inductive reactance. Additionally, the Champlin reference uses a frequency of 10 Hz to calculate the impedance which is then filtered to elimate the harmonics to minimize the error in the impedance measurement. Furthermore, the apparatus disclosed in the Champlin reference extracts small currents of approximately 1A. The extraction of small currents minimizes the noise. The Champlin reference uses the charge resistance (instead of a shunt as disclosed in Applicant's invention) to measure at its ends the circulating current. A differential amplifier is used to "clean" the signal. The use of the charge resistance instead of using a shunt to measure at its ends the circulating current and by means of a differential amplifier they "clean" the signal.

Applicant's invention uses a single short circuit impulse rather than a series of short circuits to determine the value of the ohmic resistance. The single short circuit impulse allows for the obtainment of a wave shape. As a result, the value of the ohmic resistance, the inductive and capacitive components of the circuit constituted by the instrument and the generator are deduced. This allows for the selection of the zone of the curve from which the data can be collected. Applicant's invention by means of the short circuit extracts current from the fuel cell or stack of fuel cells having a current much greater than the current suggested in the Champlin reference to minimize noise. Using the short circuit, currents ranging between 20 A for a single fuel cell to 500 A for a stack of fuel cells may be extracted. The current for the fuel cell stack may be intentionally limited to 500 A by means of a bank of selectable resistors. The bank of selectable resisters may be connected in series to the MOSFET and to the fuel cell or stack of fuel cells. This allows the selection of a specific current value which prevents the possibility of current-wave shape distortion.

Applicant's invention may use current pulse trains generated with an on/off ratio and operating frequency which is configurable by an operator. *See* Paragraph 0084. The current pulse trains simulate the behavior of an inverter which selects the most useful frequency for optimizing the symbiotic relationship of the generator/inverter. The Champlin reference on the other hand obtains the impedance value by using various formula with a base frequency of 10 Hz and by producing a series of short circuits with a charge resistance having a theoretical value of 10 Ohms. Applicant's apparatus uses a single short circuit impulse with resistances less than 1 Ohm to obtain current values ranging between 20 A (single fuel cell) to 500 A (stacks of fuel

cells). From the obtained curve, the capacitive and inductive components are excluded and only the ohmic component may be used. Only one formula (Ohm's Law) is necessary to obtain the internal resistance of the generator. Additionally, the short-term impulse (1/2 millisecond) avoids the formation of electrochemical perturbations.

For the foregoing reasons, reconsideration and allowance of Claims 7-9 are respectfully requested.

V. CLAIM REJECTIONS BASED UPON 35 U.S.C. §103(a)

In the Office Action, Claims 1-3 were rejected under 35 U.S.C. 103(a) as being unpatentable over Champlin in view of Sturman et al.

As described above, the Champlin reference does not teach, suggest, or discloses using a single short circuit impulse to obtain the internal resistance of the fuel cell or the stacks of fuel cells. The Sturman et al. reference does not teach, suggest or disclose the use of a single short circuit impulse for determining the value of the ohmic resistance. Thus, the apparatus disclosed by Applicant is not obvious in light of the Champlin and Sturman et al. references.

For the foregoing reasons, reconsideration and allowance of Claims 1-3 are respectfully requested.

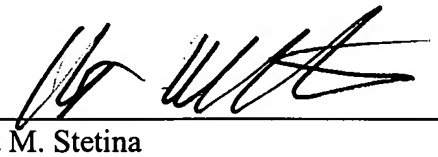
VI. CONCLUSION

For the foregoing reasons, Applicant respectfully requests reconsideration and allowance of Claims 1-11. An early notice of allowance is therefore respectfully requested.

Should the Examiner have any suggestions for expediting allowance of the application, the Examiner is invited to contact the Applicant's representative at the telephone number listed below.

If any additional fee is required, please charge deposit account number 19-4330.

Respectfully submitted,

Date: September 16, 2008 By: 

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